

FIG 2

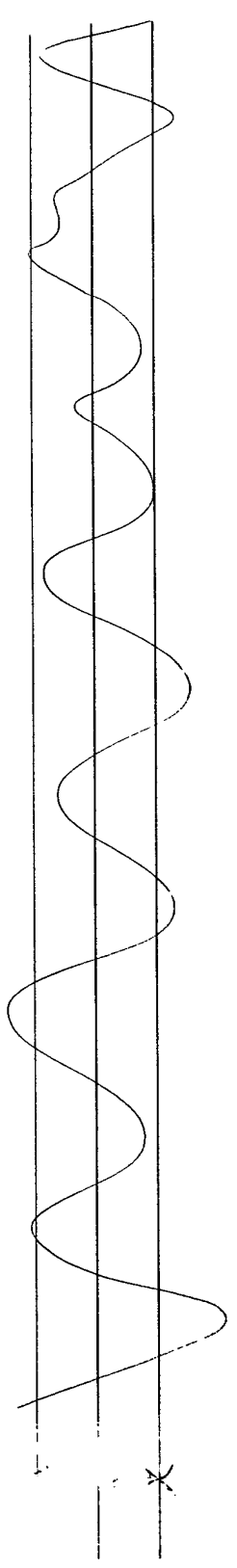
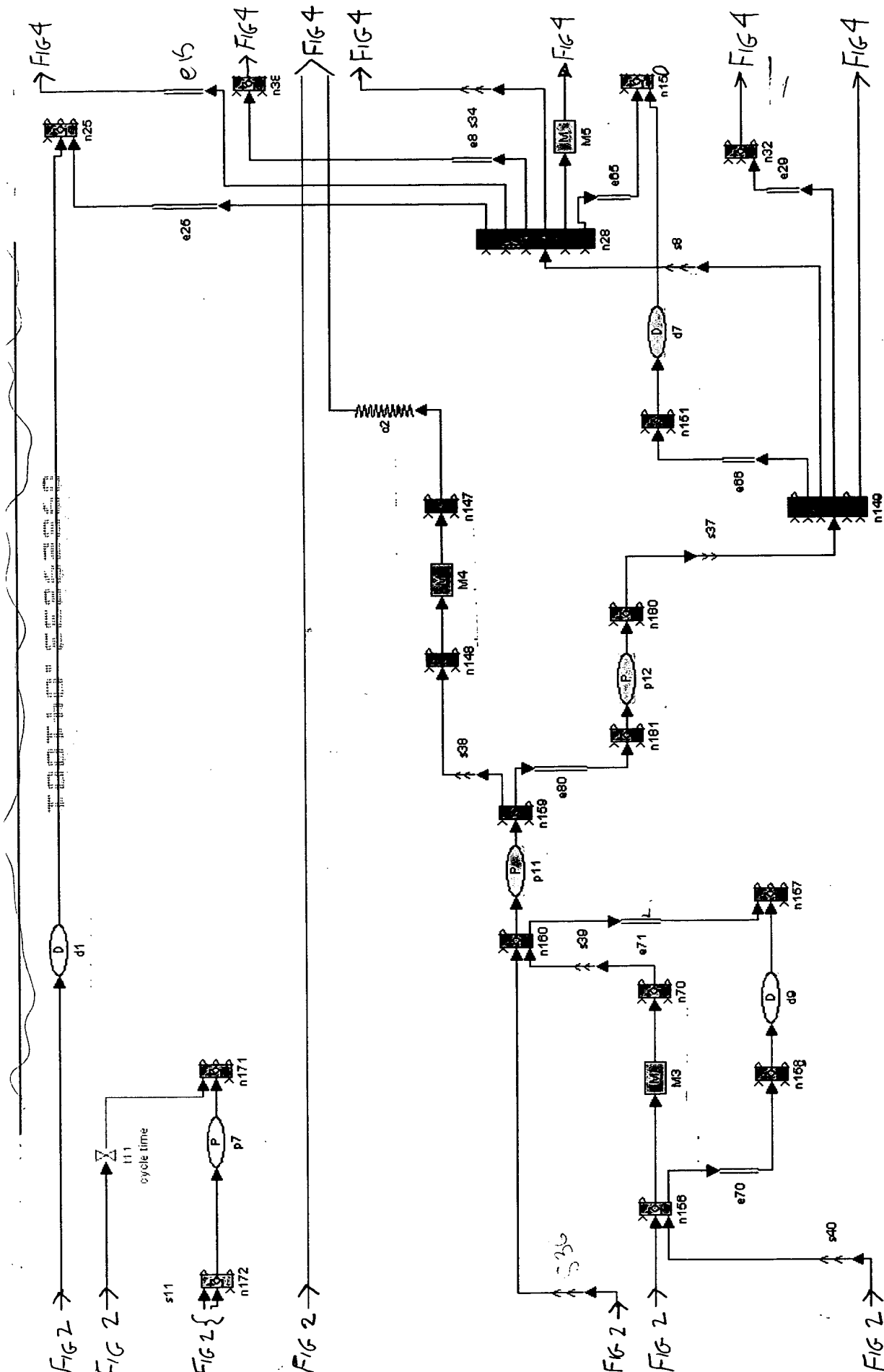


FIG 3

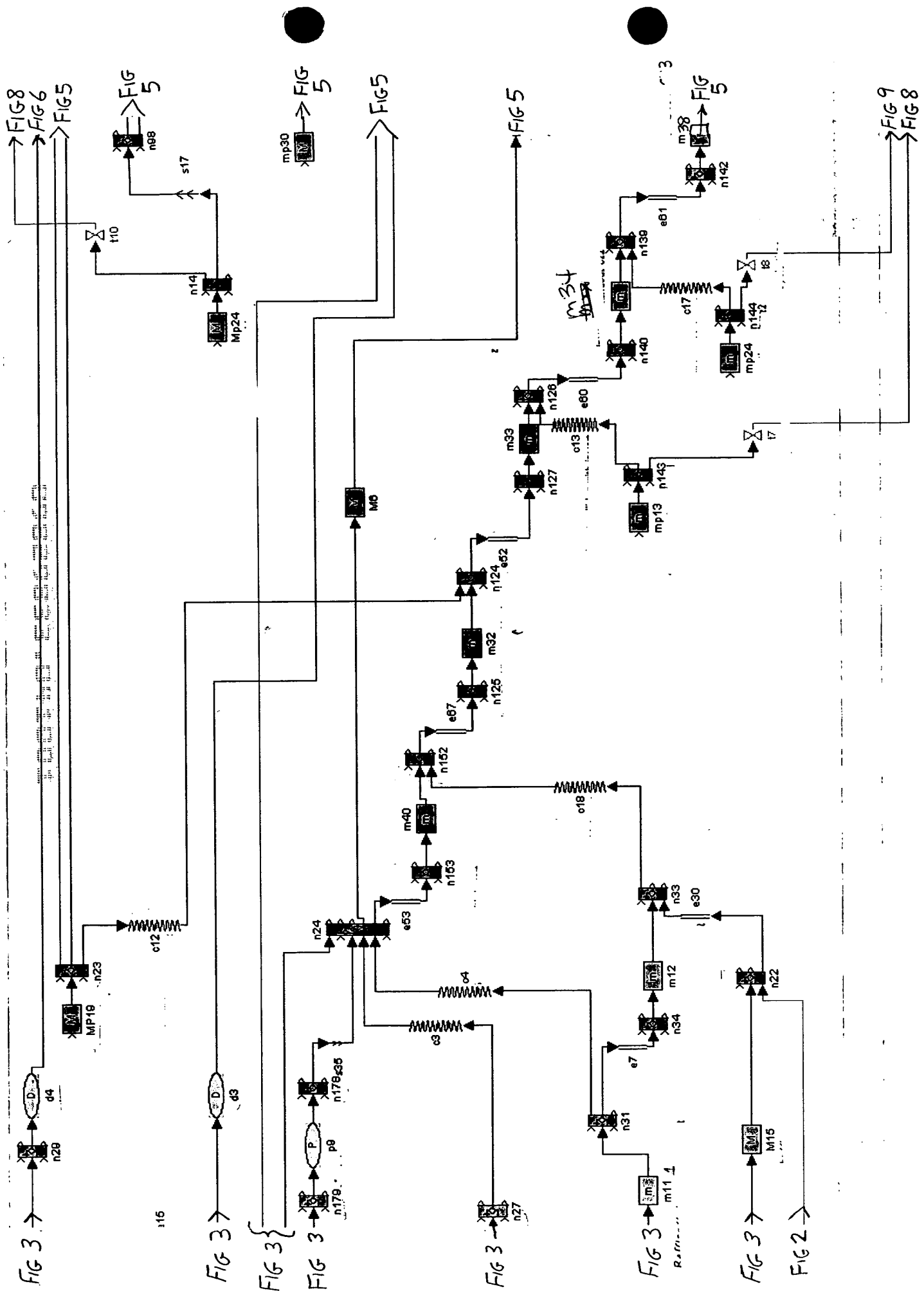


FIG 4

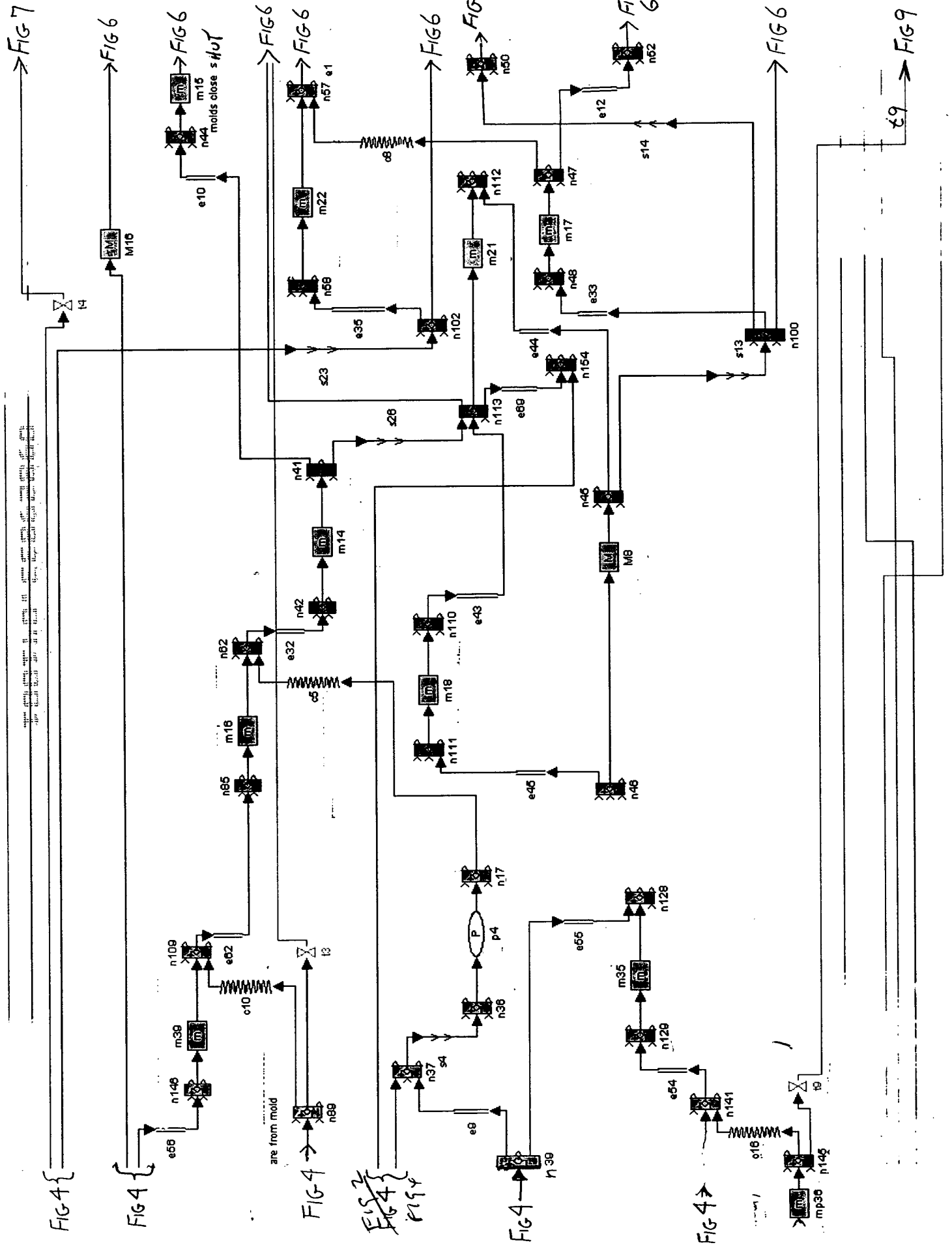


FIG 5

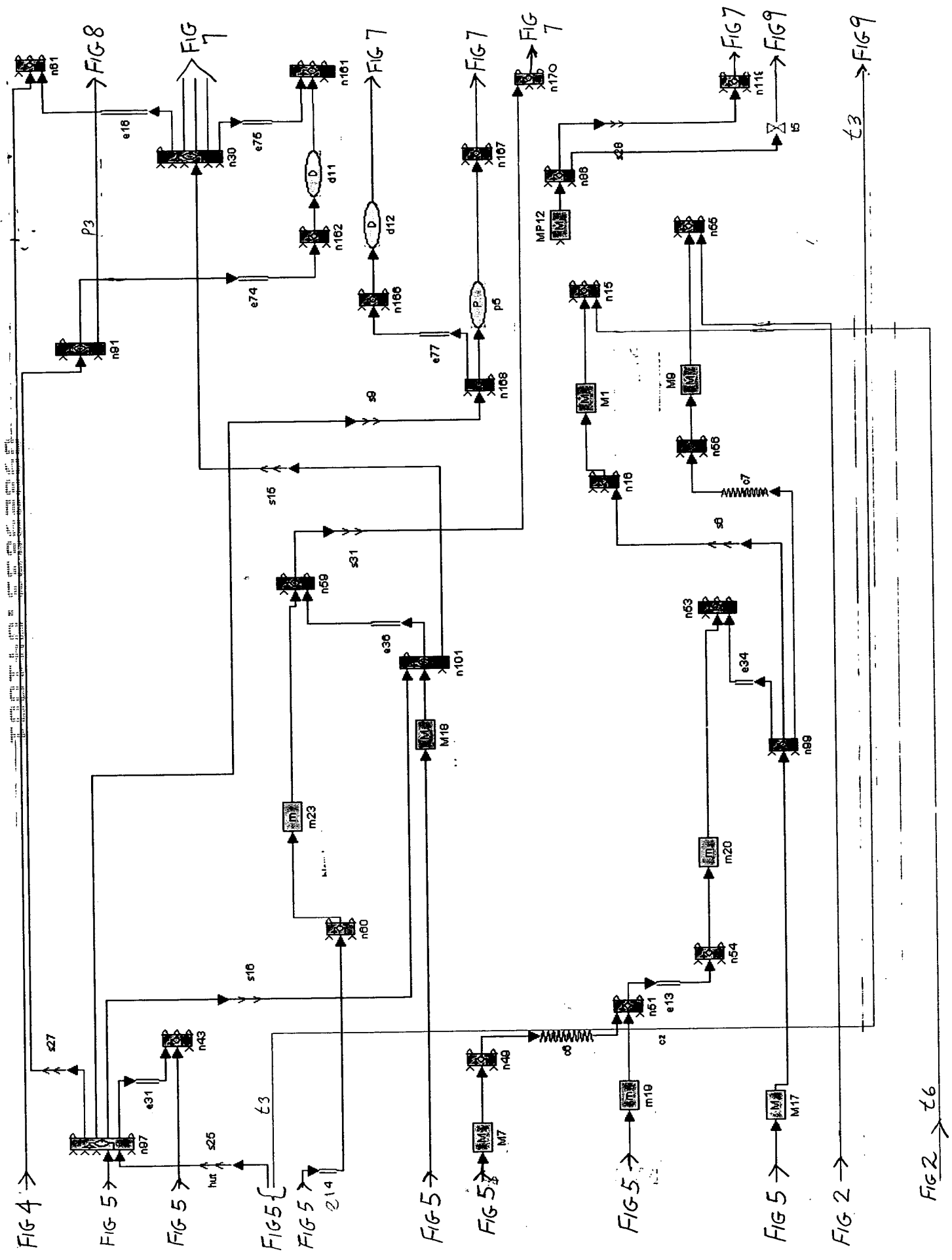
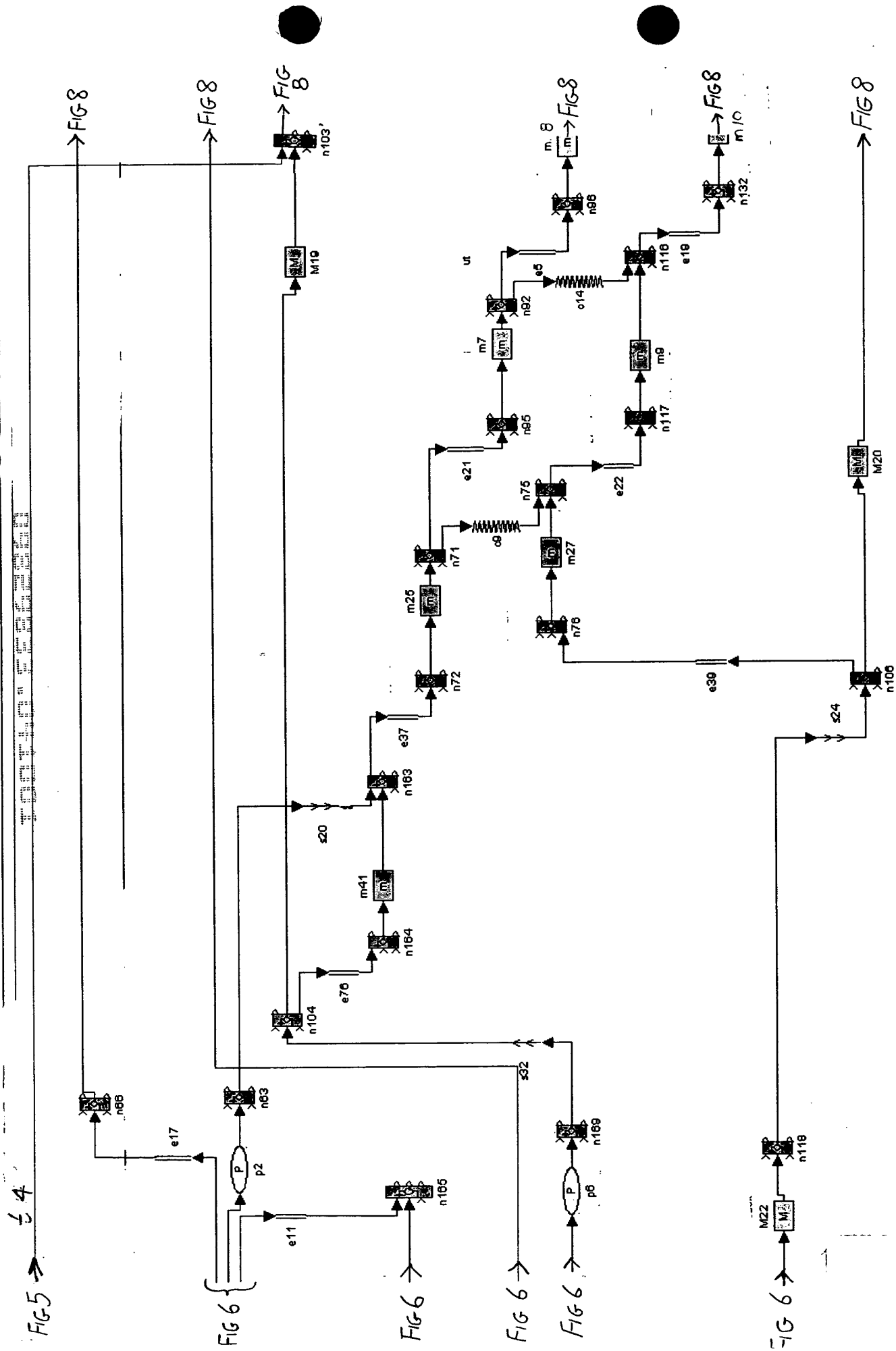


FIG 6



7.9.1

FIG 4 → t10

FIG 7 →

FIG 6 →

FIG 7 →

FIG 7 →

FIG 7 →

FIG 7 →

FIG 7 →

FIG 4 → t1

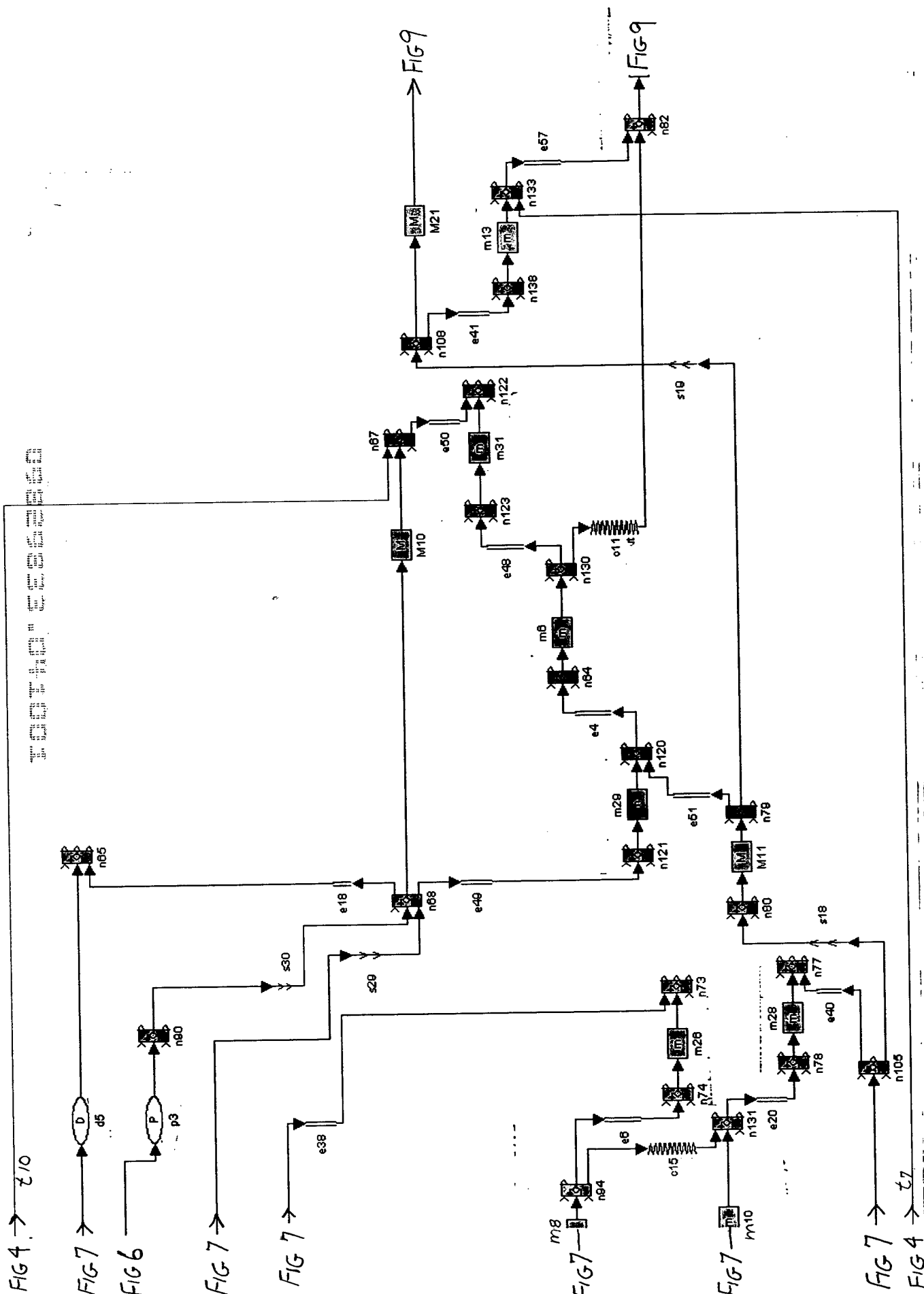
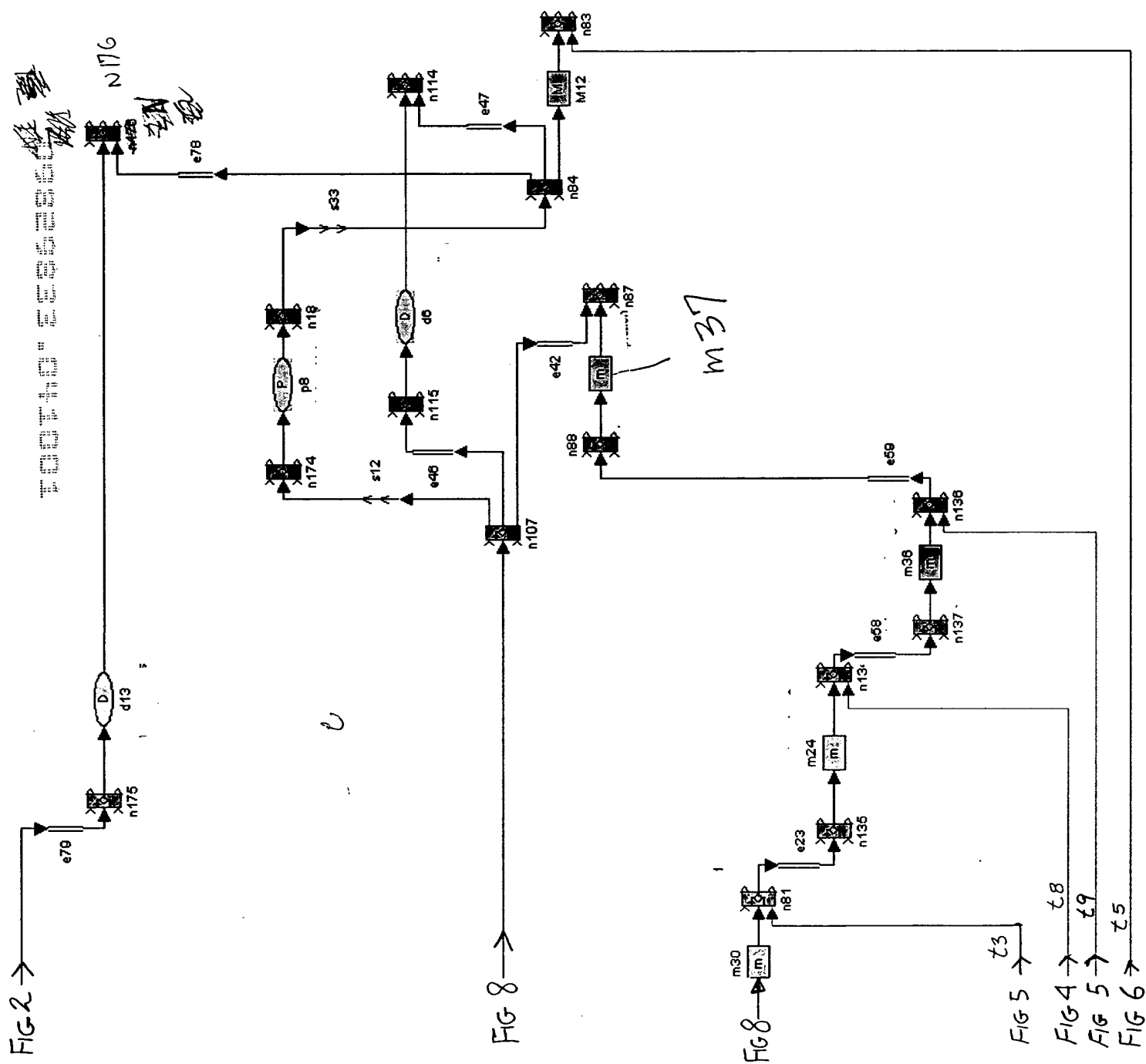


FIG 8



100170 3362969

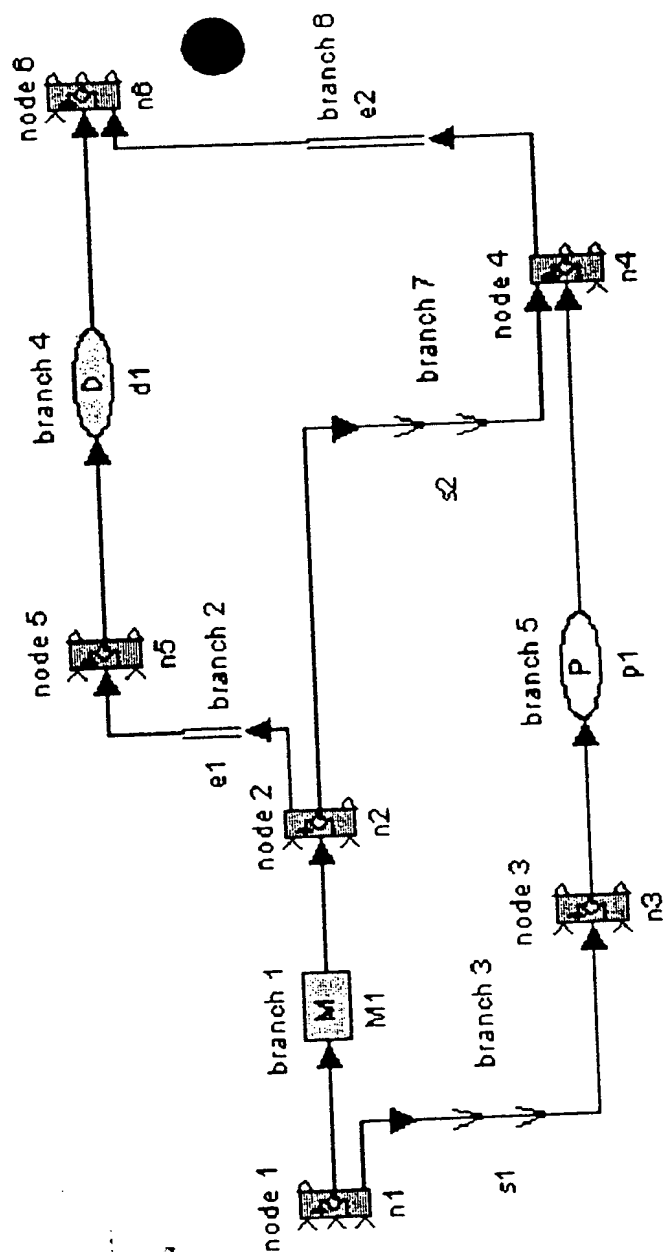


Fig-10

G H

	Events	ON	OFF
1			
2	Gob Interceptor	334	14
3	Blanks Close	324	130
4	Blanks Open	130	321
5	Plunger Up	33	123
6	First Baffle	9	125
7	Plunger Down	127	327
8	Funnel	1	150
9	Settle Blow	1	1
10	Plunger Cooling	150	260
11	Invert	200	260
12	Neckring Open	274.5	283
13	Revert	282	172
14	Molds Close/Open	229	170
15	Mold Cooling	10	150
16	Blowhead	290	113
17	Final Blow	348	120
18	Take Out IN	137	197
19	Tongs Close	178	78
20	Take Out OUT	197	90

Fig- 11

11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

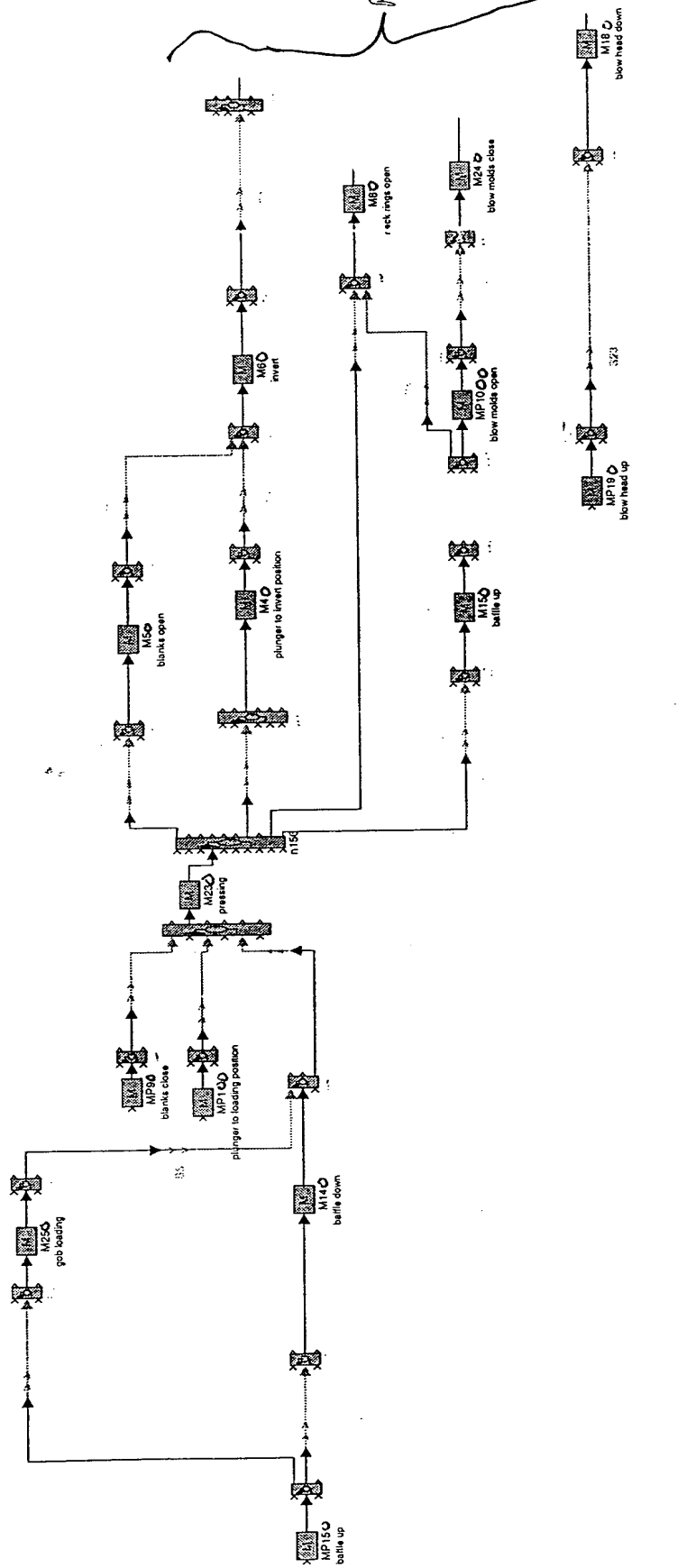


Fig-12A

11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

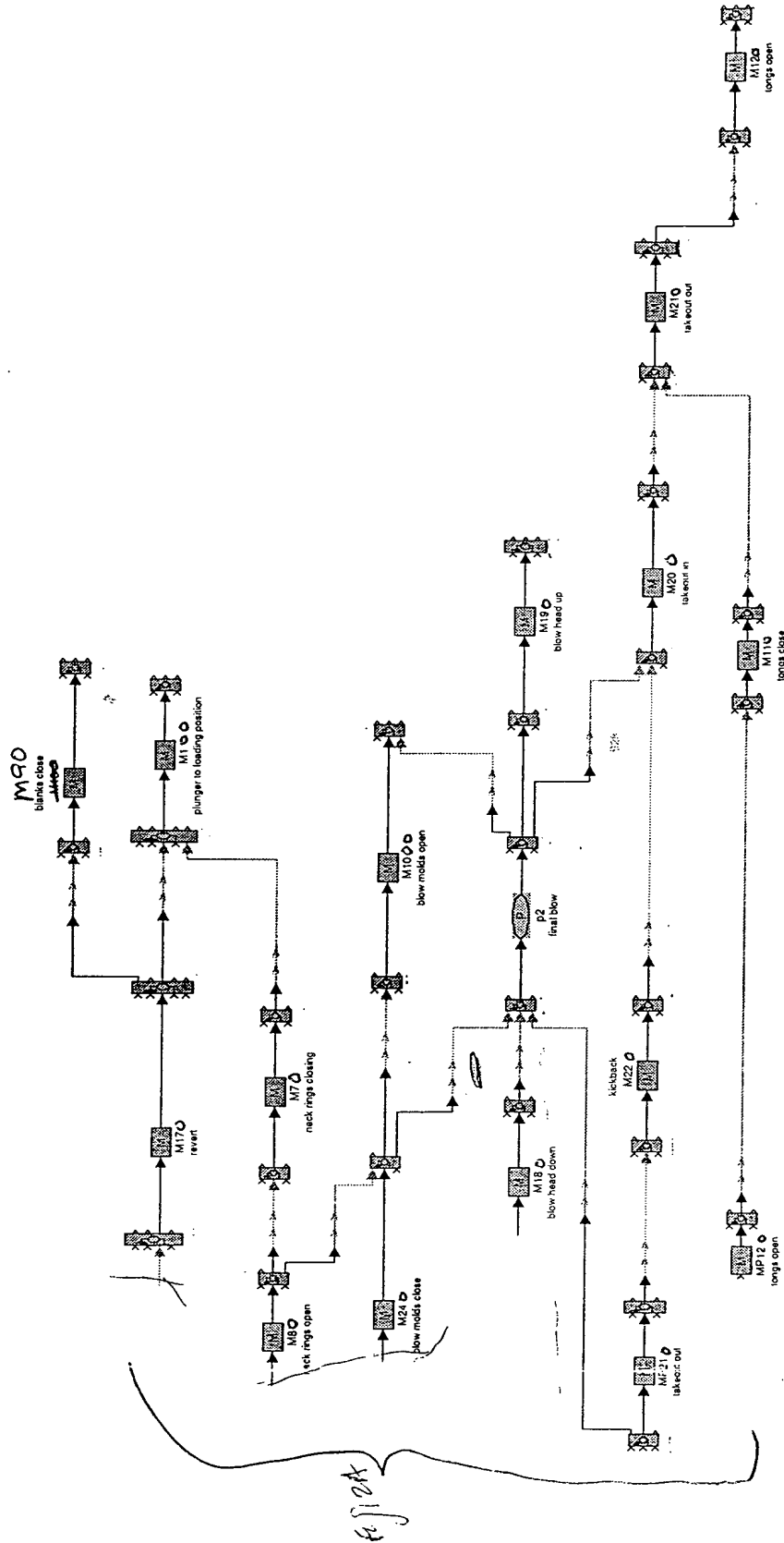


Fig 12B

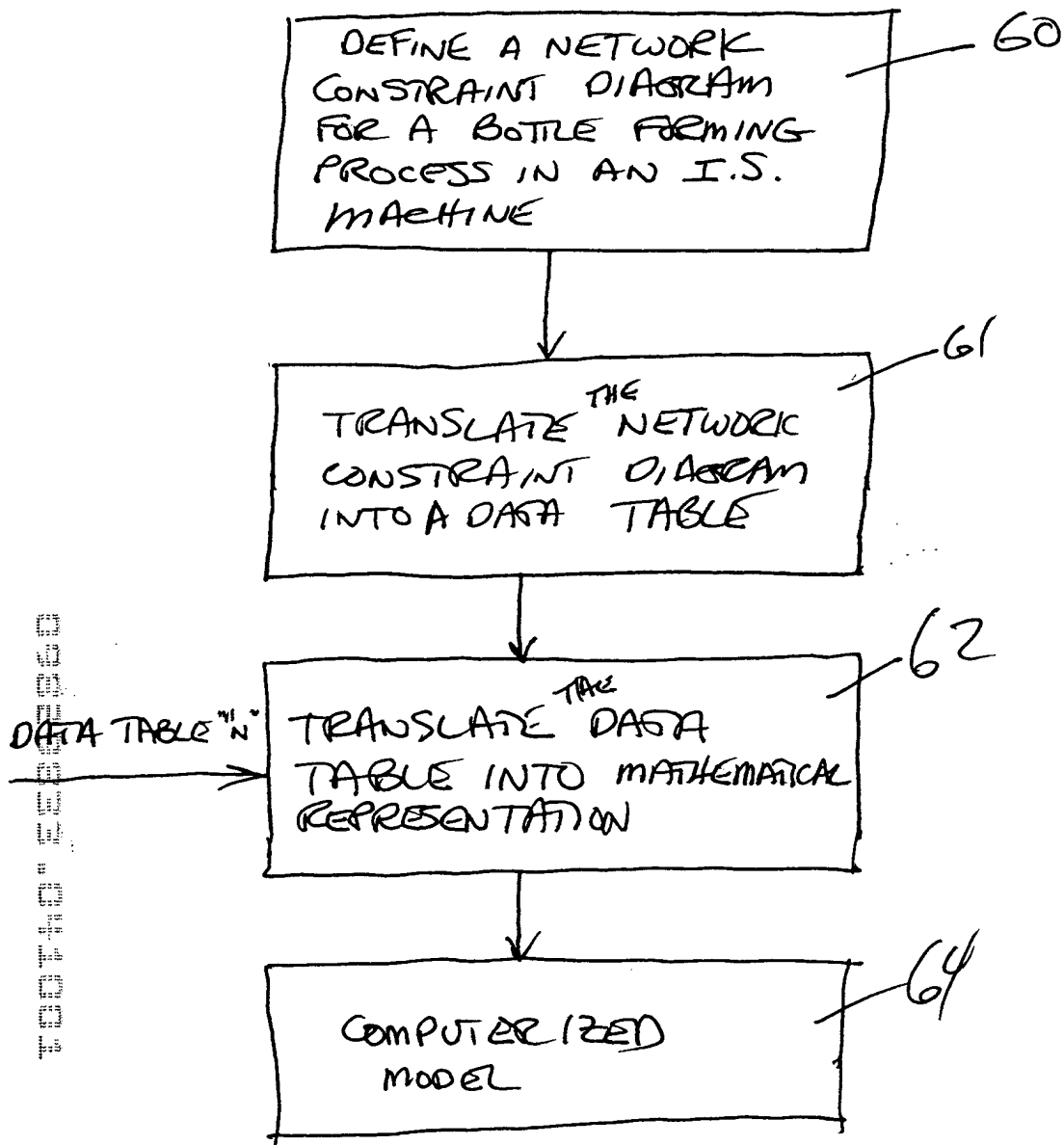


Fig-13

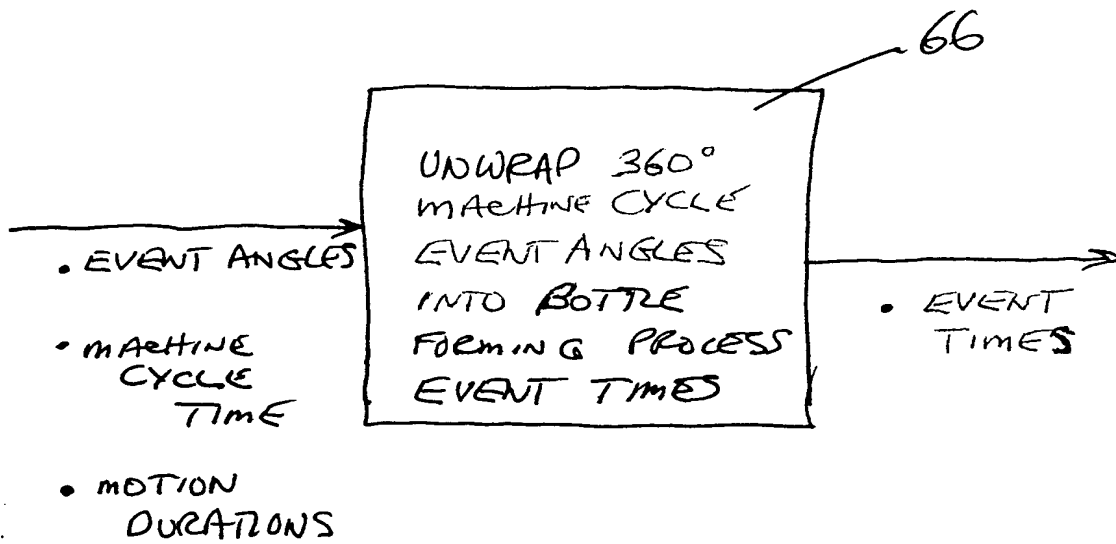
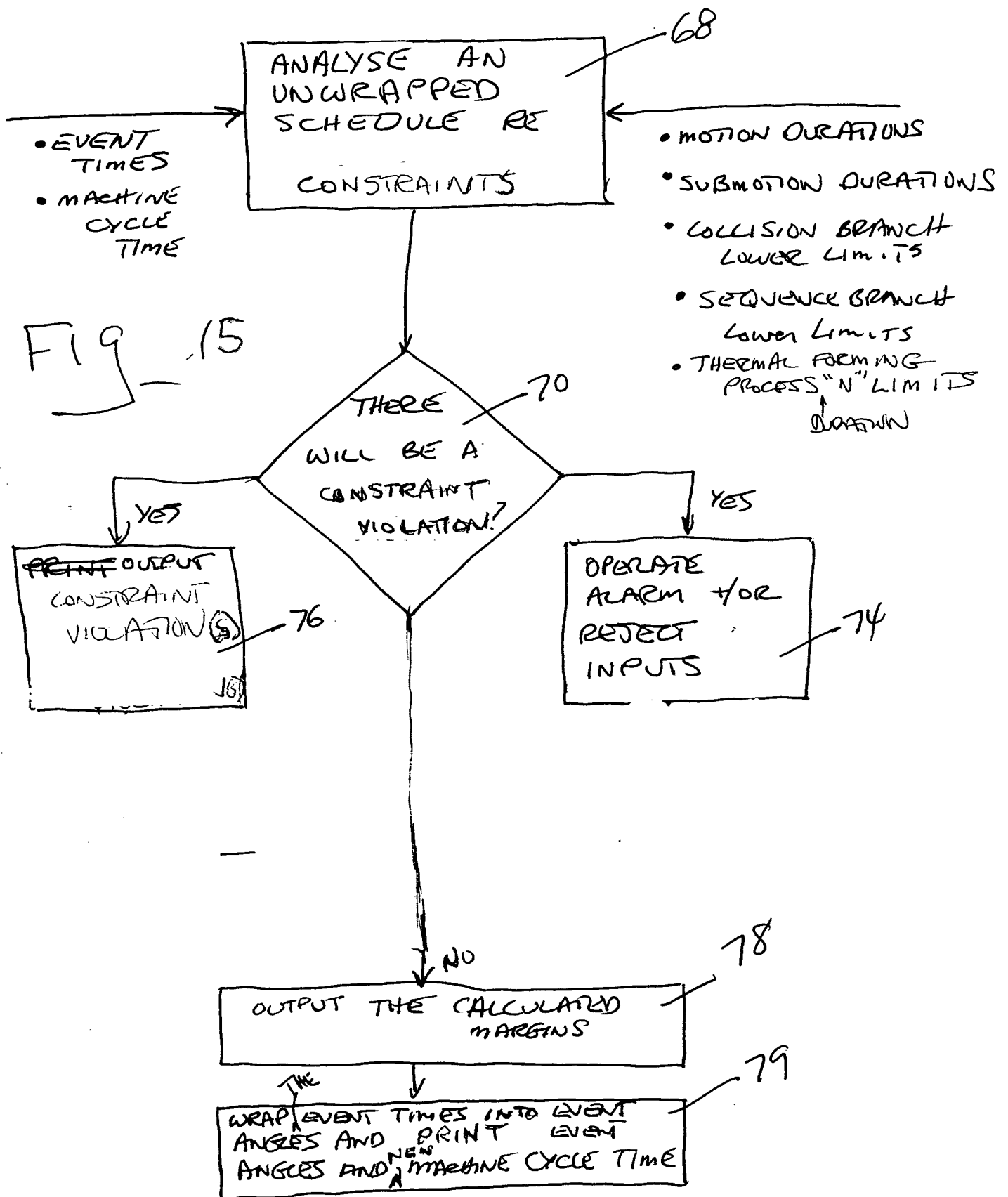


FIG-14



- EVENT TIMES
- MACHINE CYCLE TIME

- MACHINE CYCLE TIME

ANALYZE AN UNWRAPPED SCHEDULE RE THERMAL FORMING PROCESS DURATIONS

30

- MOTION DURATIONS
- SUBMOTION DURATIONS
- THERMAL FORMING PROCESS DURATION "N" LIMITS

- SUBMITTAL DURETIONS

- Thermal forming process duration "N" limits

Fig - 10

OUTPUT THE THERMAL FORMING PROCESS DURATION S

82.

OUTPUT THERMAL
FORMING PROCESS
DUE TO "N" MARGINS

18

- MOTION DURATIONS
- SUBMOTION DURATIONS
- COLLISION BRANCH LIMITS
- SEQUENCE BRANCH LIMITS

OPTIMIZE UNWRAPPED SCHEDULE FOR MINIMUM CYCLE TIME

- EVENT TIMES + MACHINE CYCLE TIME OR
- THERMAL FORMING PROCESS DURATIONS
- MACHINE CYCLE TIME
- OPTIMIZED MACHINE CYCLE TIME
- LOCK STATUS
- TARGET

83
THERE IS A FEASIBLE SCHEDULE?

NO

85
REJECT THE INPUTS

OPTIMIZED

YES

84
WRAP EVENT TIMES INTO EVENT ANGLES

86
PRINT THE EVENT ANGLES AND THE NEW MACHINE CYCLE TIME

FIG-17

- MOTION DURATIONS
- SUBMOTION DURATIONS
- COLLISION BRANCH LOWER LIMITS

- SEQUENCE BRANCH LOWER LIMITS

- EITHER EVENT TIMES +
- MACHINE CYCLE TIME OR

- THERMAL FORMING PROCESS DURATIONS

OPTIMIZE UNWRAPPED SCHEDULE

THERMAL FORMING PROCESS DURATION "N"

THERE IS A ~~FEASIBLE~~ SCHEDULE

NO

REJECT THE INPUT(S)

YES

OUTPUT THERMAL FORMING PROCESS DURATIONS

OPTIMIZED

WRAP EVENT TIMES INTO EVENT ANGLES

PRINT EVENT ANGLES AND NEW MACHINE CYCLE TIME

FIG-18

- MACHINE CYCLE TIME
- EVENT TIMES
- MOTION DURATIONS
- SUB MOTION DURATIONS
- THERMAL FORMING PROCESS DURATIONS
- COLLISION BRANCH DURATIONS
- SEQUENCE BRANCH DURATIONS

OPTIMIZE THE UNWRAPPED SCHEDULE

- MIN/MAX MOTION DURATION "N"
- MIN/MAX THERMAL FORMING PROCESS DURATION "N"
- MIN/MAX COLLISION BRANCH
- MIN/MAX SEQUENCE BRANCH "N"

98
IS THERE A FEASIBLE SCHEDULE?

NO

LOOSEN LIMITS

100

YES

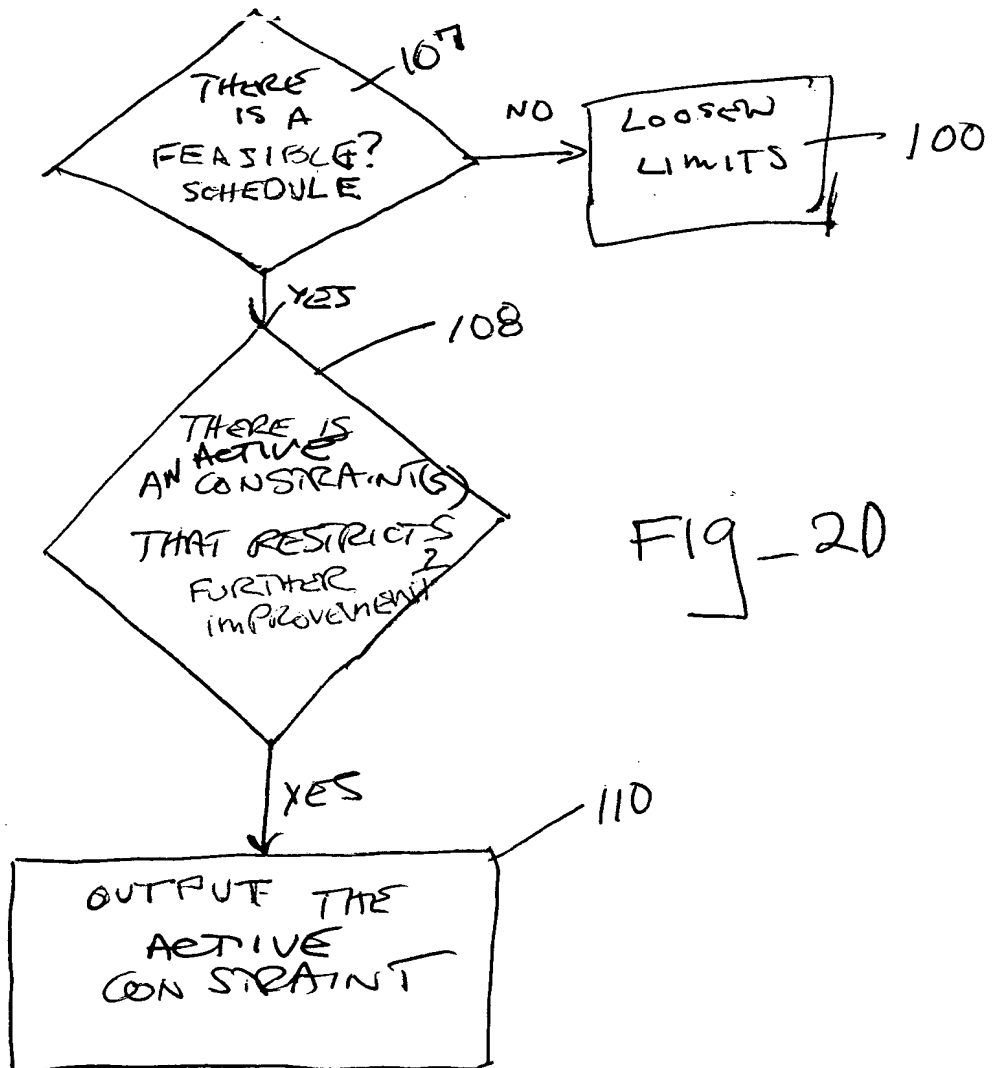
101
SET COLLISION/SEQUENCE BRANCHES TO MAX, LOCK ALL OTHER DURATIONS AND AGAIN OPTIMIZE UNWRAPPED SCHEDULE

102
WRAP EVENT TIMES INTO EVENT ANGLES

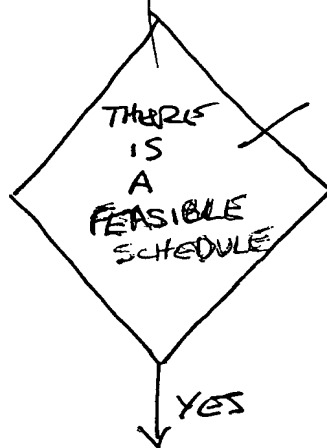
104
PRINT THE EVENT ANGLES AND THE NEW MACHINE CYCLE TIME

106
OUTPUT OPTIMIZED DURATIONS VS. LIMITS

Fig-19

[illegible]

OPTIMIZE
UNWRAPPED
SCHEDULE



LOOSEN
LIMITS

100

112

OPTIMIZE THE
UNWRAPPED SCHEDULE
LOCKING ALL VARIABLES
EXCEPT SERVO
MOTION DURATIONS AND
SETTING ^{TARGET} SERVO MOTION
DURATIONS AT LARGE VALUE

PRINT THE
OPTIMIZED
DURATION FOR
SERVO MOTOR "N"

114

DELIVER THE OPTIMIZED
DURATION FOR SERVO
MOTOR "N" TO SERVO
MOTOR "N" CONTROLLER

116

ROUTE DURATION OF
SERVO MOTOR "N" FROM
SERVO MOTOR "N" CONTROLLER
TO SERVO MOTOR "N"
AMPLIFIER DRIVE CARD

118

CHANGE TO OPTIMIZED
DURATION IN DIGITAL
SIGNAL PROCESSOR

AMPLIFIER

FIG_21